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(54) **SEAT**

(71) Applicant: **TACHI-S CO., LTD.**, Akishima-shi, Tokyo (JP)

(72) Inventors: **Hideo Tobata**, Ome (JP); **Atsushi Koike**, Ome (JP); **Tomohiro Amano**, Ome (JP); **Shogo Suzuki**, Ome (JP)

(73) Assignee: **TACHI-S CO., LTD.** (JP)

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(51) **Int. Cl.**

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B60N 2/64	(2006.01)
B60N 2/68	(2006.01)
B60N 2/16	(2006.01)
B60N 2/22	(2006.01)

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CPC ***B60N 2/643*** (2013.01); ***B60N 2/16*** (2013.01); ***B60N 2/20*** (2013.01); ***B60N 2/22*** (2013.01); ***B60N 2/646*** (2013.01); ***B60N 2/686*** (2013.01); *B60N 2002/2204* (2013.01)

(58) **Field of Classification Search**

CPC B60N 2/16; B60N 2/20; B60N 2/22; B60N 2/686; B60N 2/643; B60N 2/646

USPC 297/452.29, 452.3, 452.31, 452.32, 297/452.33, 452.34, 452.35, 440.15, 297/440.16, 354.1, 354.11, 354.12, 358, 297/361.1, 362.11, 408

See application file for complete search history.

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Primary Examiner — Rodney B White

(74) *Attorney, Agent, or Firm* — Cantor Colburn LLP

(57) **ABSTRACT**

The seatback has a seat surface curving and gradually bulging in the up-down direction, along the occupant's shoulder blades, and curving in the left-right direction and receding to support the occupant's ribs. Preferably, the seat surface of the seatback extends upward to support the lower part of the occupant's neck, thus supporting the same in the up-down direction, and recedes to support the occupant's shoulder blades in the left-right direction.

4 Claims, 10 Drawing Sheets

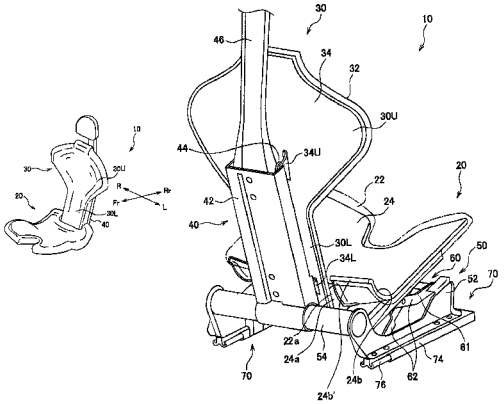

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FIG.1A

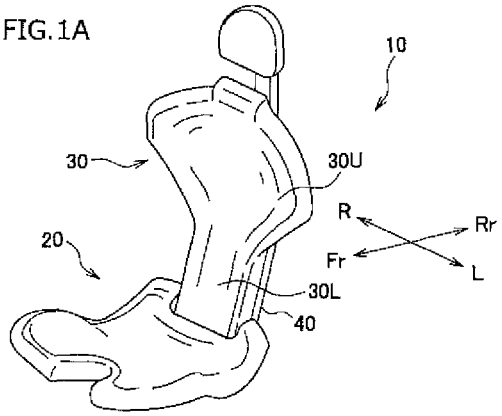


FIG.1B

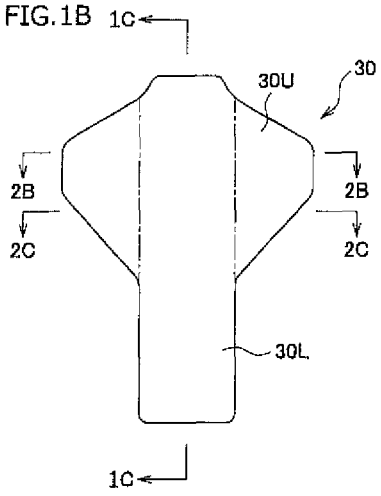


FIG.1C

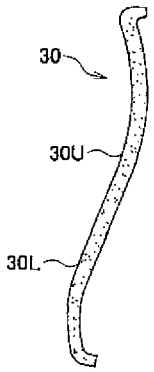
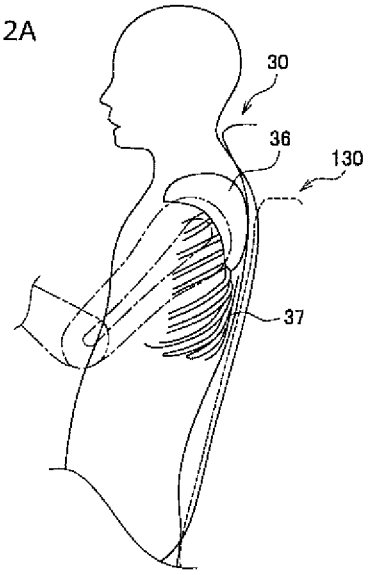


FIG.2A



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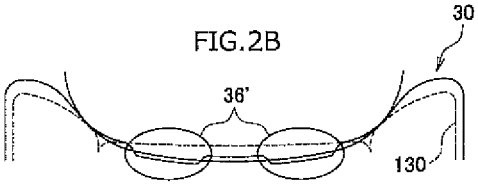

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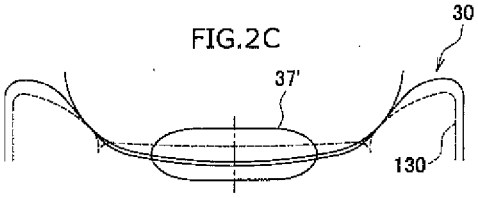


FIG.3B

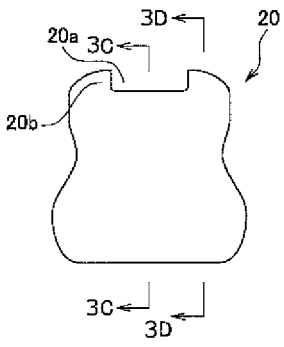
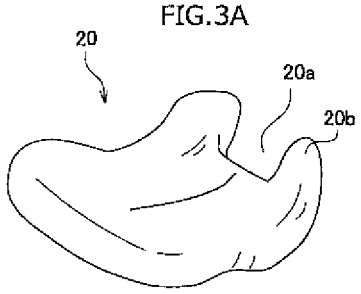


FIG.3A



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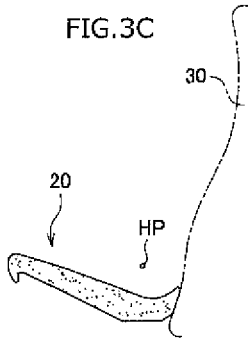

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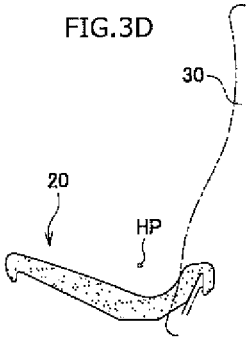

FIG.4

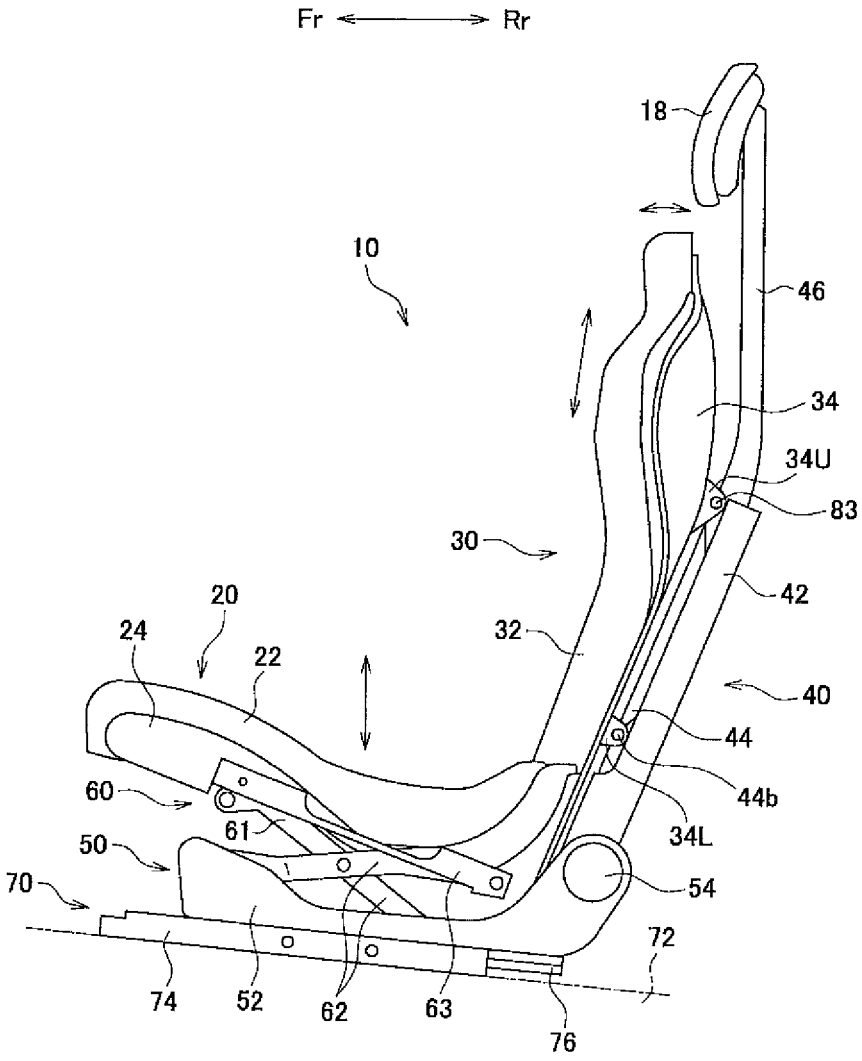
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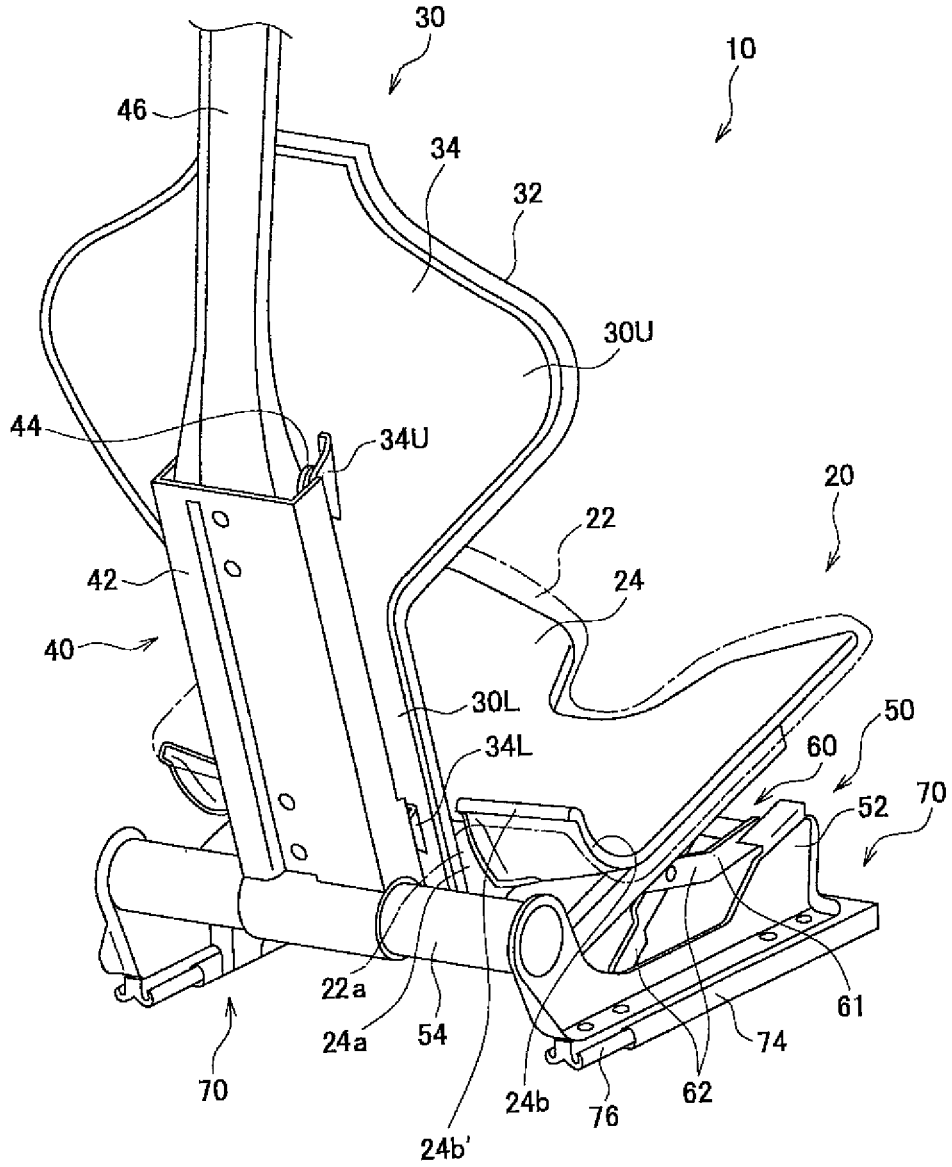
FIG.5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24a
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74
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24b
76
62
24b'

FIG.6

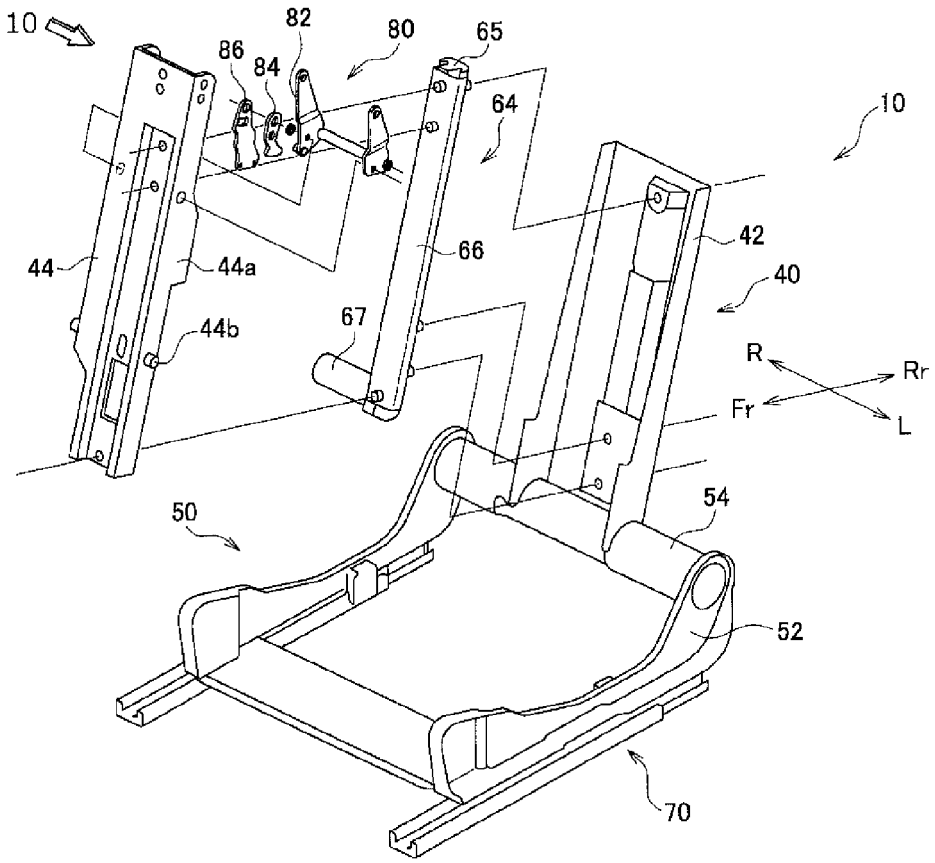


FIG.7

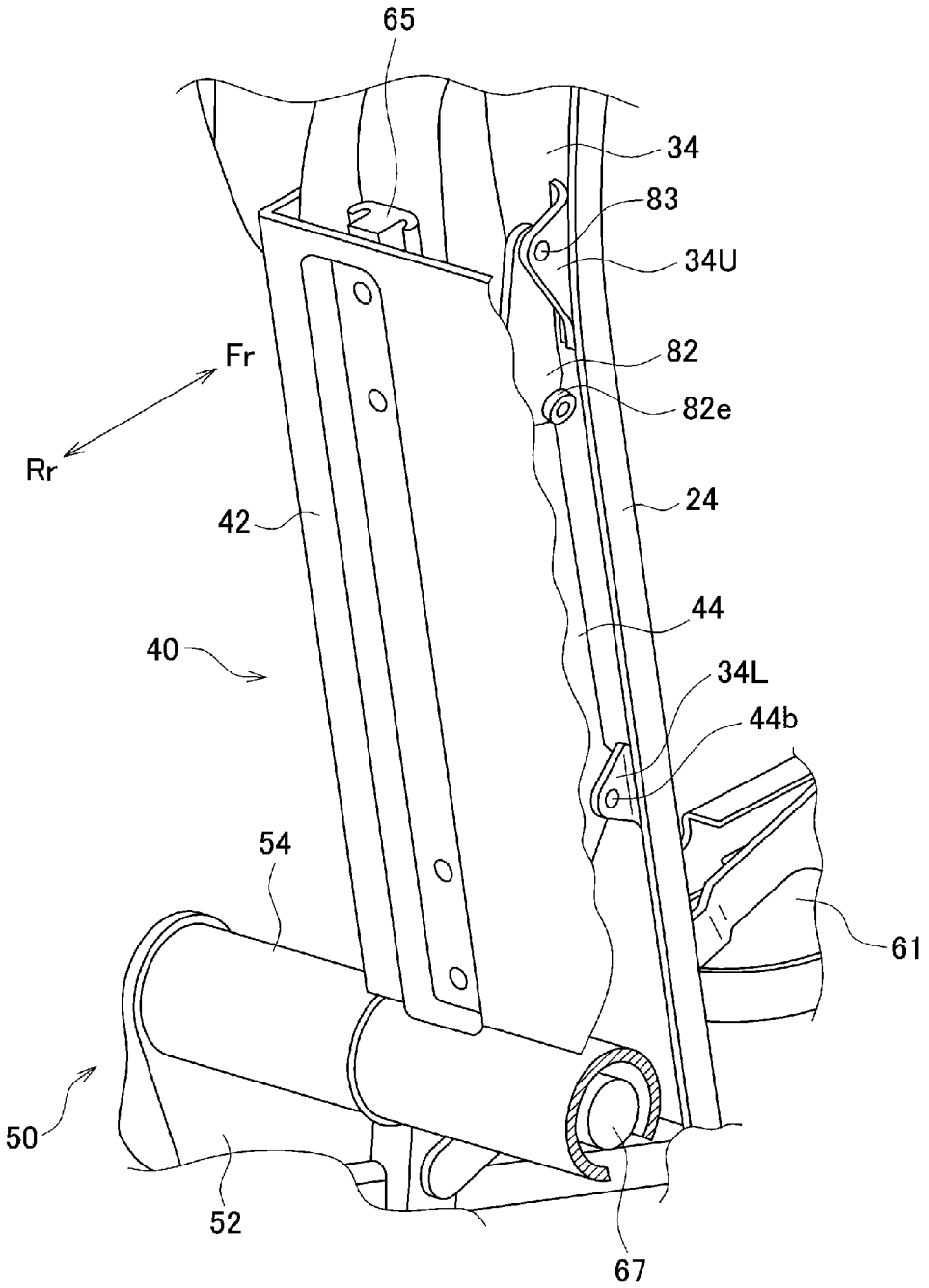


FIG.8A

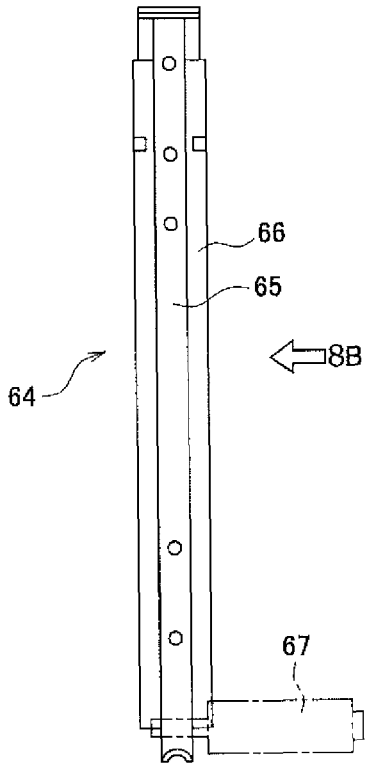


FIG.8B

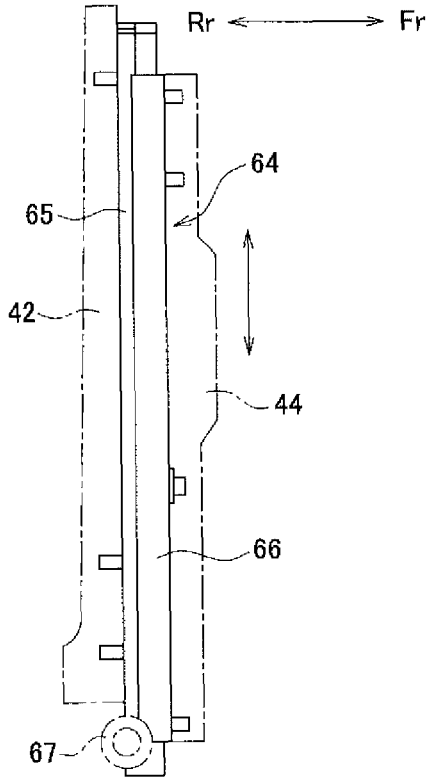
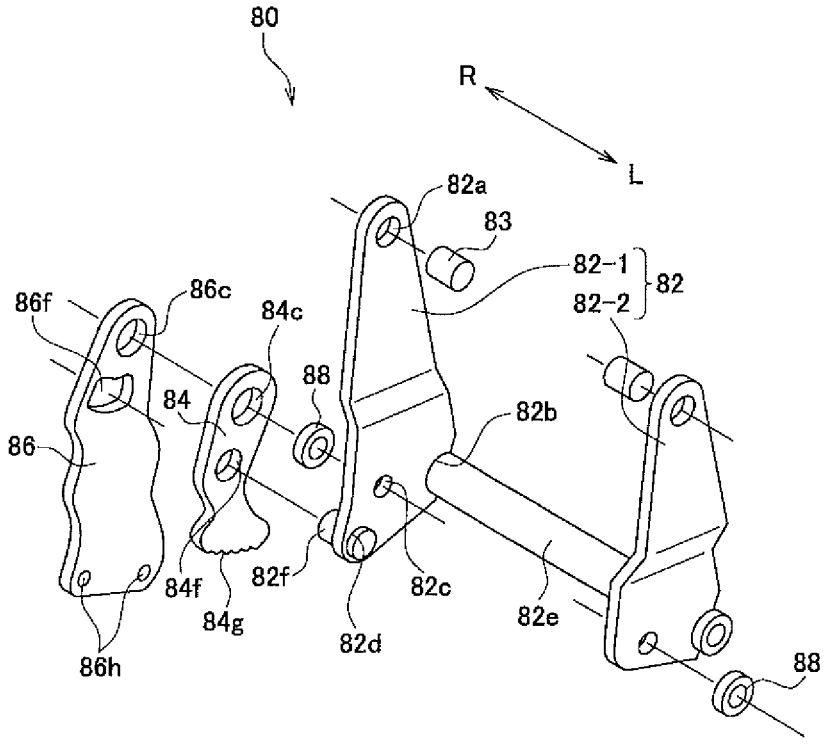


FIG.9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86h
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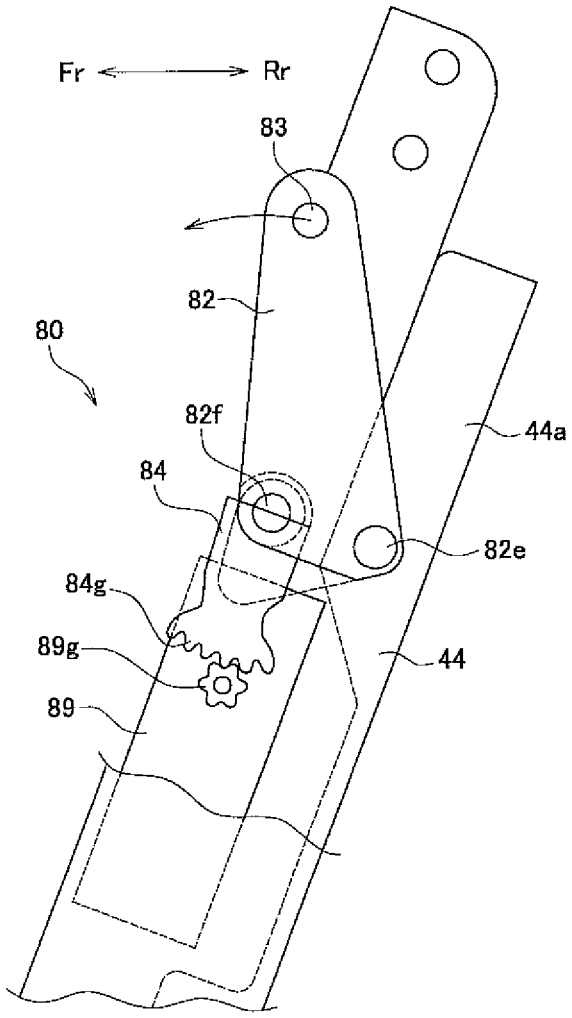
FIG.10



SEAT

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the benefit of priority from the prior Japanese Patent Application No. 2013-237968, filed Nov. 18, 2013, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a seat that has a front surface of the seatback (i.e., seat surface of the seatback) that can contact the occupant's back at a large area.

2. Description of the Related Art

Any seat should be make the occupant feel well fit in it when seated on it. A vehicle seat, for example, must be so designed that the occupant may feel well fit in it, thus reducing his or her fatigue resulting from a long sitting in the same posture. The fatigue is reduced by, for example, increasing the contact area at which the occupant's back contacts the seat surface of the seatback, thus making the occupant feel well fit in the seat.

A seat having an increased contact area is known. The seat has two ridge-shaped bulging parts called "side supports," at the left and right edges of the seatback. The side supports cover the left and right sides of the occupant, respectively. In most cases, the side supports are formed integral with the seatback. Therefore, they may or may not support the occupant well, depending on the occupant's physique (particularly, trunk width). If the occupant is of the average physique (having the average trunk width), the side supports hold him or her, as if wrapping the sides from the left and right, respectively. As a result, the occupant's back contacts the seat surface of the seatback, at a large area and at an appropriate pressure, making the occupant feel well fit in the seat.

If the occupant is a small person (i.e., slender person with a narrow trunk), however, there will be gaps, each between either side of the occupant and the side support facing the side. Due to the gaps, the side supports fail to support the occupant at the left side or the right side. Consequently, no sufficient contact area is provided between at the occupant's back and the seat surface, and the occupant cannot feel well fit in the seat. If the occupant is a big person (i.e., fatty person with a broad trunk), his or her back will push the side supports, as if collapsing the side supports. In this case, the contact pressure is high, making the occupant feel something strange. As a result, the occupant cannot feel well fit in the seat.

Most seatbacks are formed substantially flat. This is why the occupant's back, particularly the shoulder blades, is greatly pushed to the seat surface of the seatback in most cases. The contact pressure is therefore high at that part of the seatback, which contacts the shoulder blades, and the contact area is small. As a consequence, the occupant cannot feel well fit in the seat.

In the seat disclosed in JP 2011-084207A, for example, the wadding (i.e., elastic layer) interposed between the pad and trim cover of the seatback is thicker at the inner part than at outer parts that contact the side supports. The wadding may therefore cushion the occupant more at the inner side of either side support than at the outer side thereof. The thick inner part of the wadding, which lies between the side supports, undergoes elastic deformation. This makes the occupant feel well fit in the seat.

JP 01-147131U (JP 05-034430Y) discloses a seat so designed that the seat surface of the seatback may well support the occupant's shoulder blades. The pad of this seat incorporates two air mats, respectively at the left and right parts the seat surface of the seatback, which support the shoulder blades. If the occupant's shoulder blades push the seat surface of the seatback, the air mats will be deformed, and the seat surface of the seatback will softly support the shoulder blades. Therefore, the shoulder blades would not be strongly pushed to the seat surface of the seatback, and the air mats is well deformed. As the air mats are deformed, the seat surface of the seatback goes into close contact with the occupant's shoulder blades, providing a large contacting area. Thus, the seat surface of the seatback can support the occupant's back, making him or her feel well fit in the seat. The left and right side supports are not disclosed in the drawings.

If the cushion of the inner side of either support provided on the seat surface of the seatback is enough large and the wadding of the inner side of either side support is enough broad, a large contact area can be provided without increasing the contact pressure, no matter whether the occupant is small or big. The occupant can therefore feel well fit in the seat. If the wadding is thick and broad inside the side supports, however, the seat surface of the seatback may be impaired in outer appearance. Further, the seatback will inevitably become complex in structure, because the side supports are arranged on the seat surface and also because the wadding has a different thickness between the inner and outer side supports.

As described above, the air mats are deformed, supporting the occupant's shoulder blades. The air mats must therefore be incorporated in those parts of the pad, which exist at the left and right sides of the seat surface of the seatback. Inevitably, the seatback becomes complicated in structure.

An object of this invention is to provide a seat which provides a large contact area without complicating the structure of the seatback, making the occupant feel well fit in the seat.

SUMMARY OF THE INVENTION

To achieve the object specified above, this invention is based on the fact that the total length at the parts of the occupant's ribs and shoulder blades differs but a little. A seat according to the invention is designed to support the occupant, mainly at the occupant's ribs and the shoulder blades. The seat acquires a large contact area, merely by changing the shape of the seat surface of the seatback.

The seat according to claim **1** comprises a seat cushion and a seatback. The seatback has an upper half and a lower half formed integral with the upper half, the upper half of the seatback has a seat surface extending upward, first inclined backward and then inclined forward before a top part, the lower half is narrower than the upper half, the seat cushion has a U-notch, as seen from an upper surface side of the seat cushion, made in a middle part of a rear end and loosely holds the lower half of the seatback in the U-notch, and the seat cushion and the seatback are lifted or lowered, relative to each other without providing a gap between the rear end of the seat cushion and the lower end of the seatback, the rear end of the seat cushion bulges at left and right edges, the seat cushion is lifted and lowered by a seat lifter, and the seatback is secured to a strut, and the strut comprises a fixed pole and a movable pole able to move with respect to the fixed pole; and the seatback is secured to the movable pole and is lifted and lowered and inclines to the movable pole forward and backward.

In this invention of claim **1**, it is based on the fact that the total length at the parts of the occupant's ribs and shoulder blades differs but a little. That is, the seat surface of the seatback curves in both the up-down direction and the left-right direction, to support the occupant's ribs and shoulder blades. Thus, the seatback can support the occupant at ribs and shoulder blades, along the seat surface of the seatback contacting the occupant's back at a large area between the back of the occupant and the seat surface of the seatback, at a lower contact pressure. Only the seat surface of the seatback has a special shape, and the internal structure of the seatback need not be complex in structure. The seat is thus simple in structure, and can yet make the occupant well fit in the seat, regardless of his or her physique (i.e., trunk width).

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A is a perspective view showing a seat according to the embodiment of the invention;

FIG. **1**B is a front view of the seatback of the seat;

FIG. **1**C is a vertical sectional view of the seatback, taken along line **1**C-**1**C shown in FIG. **1**B;

FIG. **2**A shows the contour of the seat surface of the seatback, which extends in the up-down direction;

FIG. **2**B shows the contour of the seat surface, which extends in the left-right direction, taken along line **2**B-**2**B shown in FIG. **1**B;

FIG. **2**C is shows the contour of the seat surface, which extends in the left-right direction, taken along line **2**C-**2**C shown in FIG. **1**B;

FIG. **3**A is a perspective view of the seat cushion;

FIG. **3**B is a plan view of the seat cushion;

FIG. **3**C is a vertical sectional view of the seat cushion, taken along line **3**C-**3**C shown in FIG. **3**B;

FIG. **3**D is a vertical sectional view of the seat cushion, taken along line **3**D-**3**D shown in FIG. **3**B;

FIG. **4** is a left side view showing the seat capable lift and lower according to the embodiment of the invention;

FIG. **5** is a partly sectional, perspective view showing the seat capable lift and lower according to the embodiment of the invention, as viewed from the back;

FIG. **6** is an exploded, perspective view of the seat capable lift and lower according to the embodiment of the invention, showing neither the seat cushion nor the seatback;

FIG. **7** is a magnified, partly sectional perspective view of the seat, as viewed from the back;

FIG. **8**A is a rear view of a seatback lifting/lowering mechanism;

FIG. **8**B is a side view of the seatback lifting/lowering mechanism, as viewed in the direction of arrow **8**B shown in FIG. **8**A;

FIG. **9** is an exploded, perspective view of a seatback inclining mechanism; and

FIG. **10** is a partly sectional side view of a sheet, as viewed in the direction of arrow **10** shown in FIG. **6**.

DETAILED DESCRIPTION OF THE INVENTION

An embodiment of this invention will be described in detail, with reference to the accompanying drawings. The embodiment is a vehicle seat. In the drawing, Fr and Rr indicate the forward and backward directions with respect to the driver seated in the driver seat, and L and R indicate the leftward and rightward directions with respect to the driver.

As shown in FIGS. **1**A and **1**B, the seat **10** is a vehicle seat, and comprises a seat cushion **20**, a seatback **30**, and a strut **40**. The seatback **30** is secured to the strut **40** and isolated from the seat cushion.

As shown in FIGS. **1**A and **1**B, the upper half **30**U and lower half **30**L of the seatback **30** are shaped, greatly different in widths. The lower half **30**L is narrower than the upper half **30**U, and shaped like an elongate rectangle. That is, the upper half **30**U of the seatback **30** has a part shaped like a trapezoid and extending from either side, and is therefor, broader than the lower half **30**L in the left-right direction of the seat **10**. The lower half **30**L is narrower than the upper half **30**U because it has not trapezoidal parts. The lower half **30**L is designed to support, in the main, that part of the occupant, which lies between the hips and lower ribs. The upper half **30**U supports, in the main, the shoulder blades of the occupant.

As shown in FIGS. **2**A to **2**C, the surface of the seatback **130** of the conventional seat does not extend up to the level where it may cover and support the occupant's shoulder blades from back. Further, the seat surface of the seatback **130** is shaped flat in the left-right direction of the seat, and does not wrap or support the occupant's left or right shoulder blade at the parts of the shoulder blade.

In this invention, the seat surface of the seatback **30** curves, bulging in the up-down direction, gradually upward along the occupant's shoulder blades, and recedes in the left-right direction, supporting the occupant's shoulder blades. Preferably, the seat surface of the seatback **30** extends to support the lower part of the occupant's neck in the up-down direction, thus supporting the same, and recedes at the parts **36'** of the shoulder blade in the left-right direction.

As shown in FIGS. **2**B and **2**C, the seat surface of the seatback **30** gently recedes at the part **37'** of the occupant's ribs, extending in the left-right direction. The seat surface of the seatback **30** much recedes at two parts **36'** to support the occupant's left and right shoulder blades, and less bulges at the part lying between the two parts **36'**.

That is, the seat surface of the seatback **30** extends upward, first gently inclined backward and then gently inclined forward shortly before the top part. The seat surface of the seatback **30** extends up, also along the occupant's shoulder blades **36**, to the level where it may cover the shoulder blades from back. Moreover, the seat surface of the seatback **30** is shaped, extending along the occupant's left and right shoulder blades **36** and also along the occupant's ribs **37**, in the left-right direction, too. Thus, the seat surface of the seatback **30** is curved in the up-down direction and left-right direction, along the occupant's shoulder blades **36** and ribs **37**.

As described above, the seat surface of the seatback **30** curves in the up-down direction, gradually bulging along the occupant's shoulder blades, and recedes in the left-right direction, supporting the occupant's ribs **37**. Further, in the up-down direction, the seat surface of the seatback **30** curves along the occupant's shoulder blades and extends to the level where it may cover the shoulder blades from back. In the left-right direction, the seat surface of the seatback **30** recedes at the occupant's left and right shoulder blades. Therefore, the occupant's shoulder blades **36** and ribs **37** can be supported on the seat surface of the seatback **30**. The seat surface of the seatback can contact the occupant's back (i.e., shoulder blades and ribs) at a large area between the back of the occupant and the seat surface of the seatback, and the contact pressure is low. Only the seat surface of the seatback **30** has a special shape, and the internal structure of the seatback need not be complex in structure. Since the total length at the parts of the occupant's ribs and shoulder blades (i.e., trunk width) differs but a little, the occupant can feel well fit in the seat, regardless of his or her physique (i.e., trunk width) as he or she is supported, mainly at the ribs and shoulder blades.

Needless to say, the side supports may not be provided at the left and right edges of the seatback **30**, respectively. If this

is the case, the seat **10** is simplified in structure. Without side supports, the seat surface of the seatback **30** is simplified in shape, which enhances the outer appearance of the seat **10**.

As shown in FIGS. **3**A to **3**D, the seat cushion unit **22** has a U-notch **22***a* in the middle part of the rear end. Thus, the rear end of the seat cushion unit **22** is shaped like letter U as seen from above, and has the left and right ends bulging upward from the bottom of the U-notch **22***a*. The U-notch **22***a* has a width in the left-right direction of the seat **10** and a length in the front-back direction of the seat which the lower half **30**L of the seatback is loosely fitted.

In FIGS. **3**C and **3**D, HP indicates the hip point of the occupant.

As described above, the lower half **30**L of the seatback is narrower than the upper half **30**U of the seatback, and the U-notch **20***a* loosely holding the lower half **30**L is cut in the middle part of the rear end of the seat cushion **20**. No gap is provided between the rear end of the seat cushion and the lower end of the seatback even if the seat cushion and the seatback is lifted or lowered, relative to each other. Therefore, the seat cushion **20** and the seatback **30** can be lifted or lowered, relative to each other, in order to adjust the position of the seatback in accordance with the occupant's physique (i.e., height).

The seat cushion **20** and the seatback **30** may be configured to move up and down relative to each other. In this case, the seatback **30** (more precisely, the seat surface thereof) can be set to an optimal position for supporting the occupant at the ribs and shoulder blades, enabling the occupant to feel well fit in the seat, regardless of his or her physique (i.e., height).

The lower half **30**L of the seatback **30** is thus made narrower than the upper half **30**U, and the U-notch **20***a* for loosely holding the lower half **30**L is made in the middle part of the rear end. This minor change in shape can adjust the position of the seatback (i.e., position of seat surface) in accordance with the occupant's physique (i.e., height).

The lower half **30**L of the seatback **30** is loosely fitted in the U-notch **20***a* made in the middle part of the rear end of the seat cushion unit **22**. Further, the left and right end parts **20***b*, defining the U-notch **20***a*, do not interfere with the seatback. The left and right end parts **20***b* can therefore have any shape desirable, without preventing the seat cushion **20** and the seatback **30** from moving up or down, relative to each other. The left and right end parts **20***b* extend upward. If they extend to a level higher than the U-notch **20***a*, the seat cushion **20** will may rap the occupant's buttocks from the sides. This prevents the occupant's buttocks from moving in the left-right direction of the seat **10**. As a result, the occupant will feel his buttocks well fitted in the seat **10**.

To move the seat cushion **20** and the seatback **30** up and down relative to each other, thereby to adjust the position of the seatback (more precisely, the seat surface thereof) in accordance with the occupant's physique (i.e., height), either the seat cushion or the seatback may be lifted or lowered, or both the seat cushion and the seatback may be lifted or lowered independently of each other.

The seat cushion **20** may be lifted and lowered by, for example, a seat lifter. The strut may be composed of a fixed pole and a movable pole that can move up and down with respect to the fixed pole. If secured to the movable pole, the seatback can move up and down.

The seat **10** may be configured to lift and lower either the seat cushion or the seatback. Alternatively, both the seat cushion and the seatback may be lifted and lowered.

An embodiment of this invention will be described in detail, with reference to the accompanying drawings. The embodiment is a vehicle seat. In the drawing, Fr and Rr indicate the forward and backward directions with respect to the driver seated in the driver seat, and L and R indicate the leftward and rightward directions with respect to the driver.

As shown in FIG. **4** and FIG. **5**, the seat **10** is a vehicle seat, and comprises a seat cushion **20**, a seatback **30**, a strut **40**, a riser **50** serving as base, a lifting/lowering means **60**, and a seat sliding mechanism **70**.

The seat cushion **20** comprises a seat cushion unit **22** composed of a pad and a trim cover covering the pad, and a cushion panel **24** holding the seat cushion unit **22**. The seatback **30** comprises a seatback unit **32** composed of a pad and a trim cover covering the pad, and a back panel **34** holding the seatback unit **32**. The cushion panel **24** and the back panel **34** are made of, for example, fiber-reinforced plastic (FRP). The seat cushion unit **22** is adhered to the upper surface of the cushion panel **24**. The seatback unit **32** is adhered to the front surface of the back panel **34**.

In FIG. **2**, the seat cushion unit **22** is indicated by a one-dot, dashed line, specifying the shape of the cushion panel **24**.

The seat sliding mechanism **70** is of the type known to the public. The seat sliding mechanism **70** includes fixed rails **74** secured to the vehicle floor **72** and movable rails **76** inserted in the fixed rails **74**, respectively, to slide back and forth. To the movable rails **76**, the riser **50** is secured, and is used as seat base. The riser **50** has left and right side frames **52**, a front coupling member coupling the front ends of the left and right side frames, and a rear coupling member coupling the rear ends of the left and right side frames **52**. The rear coupling member is a hollow rod **54**.

The lifting/lowering means **60** includes a seat lifter **61** arranged between the seat cushion **20** and the riser **50**. The seat lifter **61** is of a known type such as X link type. More precisely, the seat lifter **61** comprises a pair of links **62** fastened with a pin, forming an X-shaped member. The links **62** are secured, at upper end with a pin to an upper bar **63**, and at lower end with a pin to a lower bar (not shown). Of these two pins, the front-side pin can slide back and forth. The upper bar **63** is secured to the lower surface of the cushion panel **24**, and the lower bar is provided inside the side frames **52** of the riser **50**. So configured and provided between the seat cushion **20** and the riser **50**, the seat lifter **61** can lift and lower the seat cushion **20**.

The strut **40** has its lower end mounted on, or welded to, the rear coupling member, i.e., hollow rod **54** that couples the rear ends of the left and right side frames of the riser **50**. Thus, the strut **40** is secure to the hollow rod **54**, extending substantially upright (more precisely, incline rearward a little).

The strut **40** includes a main unit **42** and a movable pole **44**. The main unit **42** is welded, at lower end, to the riser **50**. The movable pole **44** is incorporated in the main unit **42**, able to slide up and down. A pair of brackets **34**U and another pair of brackets **34**L are provided at the back of the back panel **34**. The brackets **34**U are vertically spaced from the brackets **34**L. The brackets of either pair are spaced sidewise by the width of the movable pole **44**. The brackets **34**U and the brackets **34**L secure the back panel **34** to the movable pole **44**, and the seatback **30** can therefore slide up and down, together with the movable pole.

A strut **46** is secured to the back of the back panel **34**. A headrest **18** is secured to the top of the strut **46**. The headrest **18** can therefore be moved up and down together with the seatback **30**, as the movable pole **44** is moved up and down.

The strut **46** is secured to the back of the back panel **34**, and needs only to move up and down together with the seatback **30**. It may be secured to the back of the back panel **34**, by an appropriate method available.

As shown in FIG. **4**, on the back of the back panel **34**, the lower brackets **34**L are provided at a lower part of the back panel **34**, and the upper brackets **34**U are provided at a little above the middle section of the back panel **34**.

In this embodiment, the seat lifter **61** lifts or lowers the seat cushion **20** with respect to the seatback **30**, and a lifting/lowering mechanism other than the seat lifter **61** lifts or lowers the seatback with respect to the seat cushion. That is, the lifting/lowering means **60** includes a lifting/lowering mechanism (seatback lifting/lowering mechanism) **64**, in addition to the seat lifter **61**.

As may be seen from FIG. **6** and FIGS. **8**A and **8**B, the seatback lifting/lowering mechanism **64** is based on the seat sliding mechanism known to the public. The mechanism **64** includes a fixed rail **65** and a movable rail **66** covering the fixed rail **65**. The mechanism **64** is identical in configuration to the known seat sliding mechanism, except that the fixed rail **65** is provided inside the movable rail **66**. Instead, the movable rail **66** may, of course, be provided inside the fixed rail **65**.

The seat siding mechanism of the known type is configured to slide back and forth. By contrast, the seatback lifting/lowering mechanism **64** is configured to slide in vertical direction (thus able to move up and down).

The seatback lifting/lowering mechanism **64** is similar to the known seat sliding mechanism in basic configuration, and will not described in detail. In this embodiment, a motor **67** is mounted on the fixed rail **65**, though not described here in detail. The driving force of the motor **67** is reduced and rotates a pinion gear (not shown) meshed with the lack (not shown) provided on the movable rail **66**. Hence, if the motor **67** is driven, the movable rail **66** will move up or down along the fixed rail **65**, while being guided by the fixed rail **65**.

In the embodiment, the rear coupling member **54** coupling the rear ends of the left and right side frames **52** of the riser is a hollow rod. As shown in FIG. **7**, the motor **67** of the seatback lifting/lowering mechanism **64** is incorporated in the hollow rod. The motor **67** is therefore concealed, not impairing the outer appearance of the seatback lifting/lowering mechanism **64**.

The main unit **42** of the strut **40** is fastened to the fixed rail **65** and the movable pole **44** is fastened to the movable rail **66**, for example by using bolts, respectively. The main unit **42** and the movable pole **44** have a U-shaped cross section, respectively. The main unit **42** opens at front, and its front is covered with the movable pole **44**. The seatback lifting/lowering mechanism **64** is arranged between the main unit **42** and the movable pole **44**.

Using a seat sliding mechanism of known type, the seatback lifting/lowering mechanism **64** can be small and light, and can yet easily move the movable pole **44** with respect to the main unit **42** of the strut **40**. Secured to the movable pole **44**, the seatback **30** is lifted or lowered, together with the movable pole. The seatback **30** can therefore be adjusted in the position of the seat surface, in accordance with the occupant's physique. This makes the occupant feel well fit in the seat.

The lower half **30**L of the seatback is made narrower than the upper half **30**U. The U-notch **20***a* is made in the middle part of the rear end of the seat cushion, and loosely holds the narrow lower half of the seatback. Therefore, no gap will be made between the rear end of the seat cushion and the lower end of the seatback even if the seatback **30** is lifted or lowered and thereby the seatback can be adjusted in position in accordance with the occupant's physique.

Moreover, the lower half **30**L of the seatback **30**, which is narrower than the upper half **30**U, is loosely fitted in the U-notch **20***a* that is made in the middle part of the rear end of the seat cushion. Hence, the left and right end parts **20***b*, defining the U-notch **20***a* between them, does not interfere with the seatback **30**, and the seatback **30** can be lifted and lowered without interfering with the seat cushion **20**.

Needless to say, the seatback **30** can be adjusted in position in accordance with the occupant's physique, not impairing the occupant's feeling of being well fit in the seat **10**, even when the seat lifter **61** lifts or lowers the seat cushion **20**. Even after the seat cushion **20** has been lifted or lowered, no gap is made between the rear end of the seat cushion and the lower end of the seatback. Further, the seat cushion can be lifted and lowered, never interfering with the seatback **30**.

As shown in FIG. **6**, two pins **44***b* protrude from the left and right walls **44***a* of the movable pole. The pins **44***b* are pivotally held, respectively in two support holes made in the left and right lower brackets **34**L provided on the lower part of the back of the back panel **34**.

As shown in FIG. **9**, the seat **10** further comprises an inclination mechanism **80** for the seatback configured to incline the seatback **30**. The inclination mechanism **80** is provided on the movable pole **44**, at a position well above the pins **44***b* protruding from the walls of the movable pole.

As shown in FIGS. **6**, **9** and **10**, the inclination mechanism (or seatback inclining mechanism) **80** includes a main link **82**, a drive link **84**, and a regulation link **86**. The main link **82** is composed of a pair of main links (or first and second main links) **82-1** and **82-2**.

Each of the first and second main links **82-1** and **82-2** has one support hole **82***a* in one end (upper end), and two support holes **82***b* and **82***c* in the other end (lower end, or free end). The firs main link **82-1** has another support hole **82***d* made in a corner of the lower end (free end) of the first main link **82-1**.

A connecting rod **82***e* has its ends fitted, respectively in the support holes **82***b* made in the lower ends of the first and second main links **82-1** and **82-2**. The first main link **82-1** and the second main link **82-2** are thereby coupled and can be moved together. Pins **83** pass through the support holes **82***a* and are pivotally supported, by the left and right brackets **34**U provided at the upper part of the back of the back panel **34** (see FIG. **7**). A pin (rotation control pin) **82***f* is fitted in the support hole **82***d* made in a lower corner of the first main link **82-1**.

The drive link **84** and the regulation link **86** are arranged outside the first main link **82-1**. A support hole **84***c* is made in the upper end of the drive link **84**, and a support hole **86***c* is made in the upper end of the regulation link **86**. Step pins (not shown) extend outwards from the left and right walls **44***a* of the movable pole, passing through the support holes **84***c* and **86***c* and a washer **88**, and then through the support hole **82***c* of the first main link **82-1**, and is pivotally supported by the side walls **44***a* of the movable pole. A step bolt (not shown) extends from outside, passing through another washer **88** and the support hole **82***c* of the second main link **82-2**, and is secured to the side walls **44***a* of the movable pole **44**. The main link **82** is thereby arranged between the left and right side walls of the movable pole **44**.

Holes **84***f* and **86***f*, in which the rotation control pin **82***f* extending from the first main link **82-1** is inserted, are made in the drive link **84** and the regulation link **86**, respectively. A section gear **84***g* is provided at the lower end of the drive link **84**. The hole **86***f* of the regulation link **86** is an elongated hole arching around the support hole **86***c* made in the upper end of the regulation link.

The step pin extends through the support hole of the support hole **82***c* of the first main link **82-1**, the support hole **84***c* of the drive link **84** and the support hole **86***c* of the regulation link **86**. Further, the rotation control pin **82***f* extends from the

first main link **82-1** and is inserted in the hole **84***f* of the drive link. The drive link **84** and the main link **82** can therefore rotate together.

Since the rotation control pin **82***f* is inserted in the arching elongated hole **86***f* of the regulation link **86**, the rotation of the drive link **84** and main link **82** is limited to the distance the rotation control pin **82***f* moves in the elongated hole **86***f*.

Two holes **86***h* are made in the lower end of the regulation link **86**. Using these holes **86***h*, the regulation link is bolted to the movable pole **44**.

As shown in FIG. **10**, an actuator **89** incorporating a motor (not shown) is secured to the movable pole **44**. The section gear **84***g* of the drive link extends into the actuator **89** and is set in screw engagement with a pinion gear **89***g*. The drive link **84**, which has the section gear **84***g* set in mesh with the pinion gear, rotates when the pinion gear **89***g* is rotated by the motor. As a result, the main link **82** rotates together with the drive link.

The pins **44***b* protruding from the left and right walls **44***a* of the movable pole **44**, respectively, are pivotally supported in the support holes of the lower brackets **34**L provided on the back panel. The back panel **34** can therefore incline forward and backward (or rotate) around the pins **44***b* pivotally, as much as allowed by the rotation control pin **82***f* and the elongated hole **86***f*.

A torque limiter (not shown) is provided on the actuator **89** and arranged between the motor and the pinion gear **89***g*, and therefore controls the output of the motor.

The main link **82** and the drive link **84**, which rotate together, may be formed integral.

In other words, the drive link **84** may not be used, and the first main link **82-1** may extend downward from the rotation control pin **82***f*, and the section gear **84***g* may be provided on the lower edge of the first main link **82-1**. Further, the rotation control pin **82***f* may be inserted directly into the elongated hole **86***f*. In this case, the back panel **34** can rotate forward and backward around the pins **44***b* pivotally, as much as allowed by the rotation control pin and the elongated hole.

In this configuration, the inclination mechanism **80** can be simplified in structure because the drive link **84** is not at all.

The lower brackets **34**L are provided on the lower end of the back panel **34**, and the seatback **30** is inclined (or rotated) around the pins **44***b* pivotally supported by the lower brackets **34**L. That is, the center of rotation is set at the lower end of the seatback **30**. This suppresses the back-and-forth motion of the lower half **30**L of the seatback, which supports that part of the occupant, lying between the hips and lower ribs, even if the seatback **30** is inclined. The inclination of the seatback can therefore be adjusted without increasing the interference between the U-notch **20***a* made in the rear end of the seat cushion and the lower end of the seat back **30**.

The torque limiter controls the output of the motor, which is transmitted to the pinion gear **89***g*. If another vehicle hits the rear of the vehicle having the seat **10**, imposing an impact on the seat **10**. In this case the pinion gear **89***g* slips, inclining the seatback **30** while absorbing the impact energy. This moderates the impact applied to the occupant, ensuring the safety of the occupant.

The back panel **34** is lifted or lowered, together with the movable pole **44**, along the main unit (fixed pole) **42**, in accordance with the occupant's physique(height), without impairing the occupant's feeling of being well fit in the seat **10**. Hence, not only can the seatback **30** be adjusted in position, but also can the back panel **34** incline to the movable pole.

If the seatback **30** is inclined at the position to which it has been lifted or lowered, the seatback can be further adjusted in position in accordance with the occupant's physique (height), without impairing the occupant's feeling of being well fit at the seat surface of the seatback.

In the embodiment, the lifting/lowering means **60** configured to lift and lower the seat cushion **20** and the seatback **30**, relative to each other, includes the seat lifter **61** for the seat cushion in addition to the seatback lifting/lowering mechanism **64**. Further, the seat cushion **20** and the seatback **30** are configured to be lifted and lowered, independently of each other. Hence, the seat cushion **20** and the seatback **30** can be lifted and lowered relative to each other, for a longer distance. This reliably adjusts the seatback in position in accordance with the occupant's physique (height). Both an occupant much bigger than average persons and an occupant much smaller than average persons can feel well fit in the seat **10**.

If lifted by the seat lifter **61**, the seat cushion **20** will move back and forth. Nonetheless, the inclination mechanism **80** for the seatback **30** can adjust the inclination of the seatback. This gives the occupant a line of sight appropriate for his or her physique. The occupant can therefore feel fit in the seat **10**, regardless of his or her physique, even while the seat lifter **61** is operating.

The inclination mechanism **80** for the seatback may be provided directly on the main unit **42**, not on the movable pole **44**, and the seatback **30** may be provided on the main unit **42** and may be inclined. In this case, the seatback will be adjusted in position in accordance with the occupant's physique (height) if the seat lifter **61** lifts or lowers the seat cushion **20**.

If the conventional seatback, which is composed of upper and lower halves, is lifted, a gap will exist between the upper and lower halves, and the occupant will no longer feel well fit on the seatback. By contrast, the seatback **30** of this invention is a single-piece product, never to have a gap even if it is lifted or lowered. This ensures the occupant a well-fit feeling on the seat surface of the seatback.

The strut **46**, which has the headrest **18** on the top and is secured to the movable pole **44**, is lifted or lowered together with the seatback **30**, whereby the headrest is lifted or lowered. The headrest **18** can therefore support the occupant's head, not impairing the occupant's feeling of being well fit in the seat **10**, even if the seat surface of the seatback **30** is adjusted in position in accordance with the occupant's physique.

As described above, the seat according to this invention can support the occupant, mainly at the ribs and shoulder blades, making the occupant feel well fit in the seat, regardless of his or her physique (i.e., trunk width).

Further, the lower half of the seatback may be formed narrower than the upper half, and the seat cushion may have a U-notch made in the middle part of the rear end thereof.

In this case, no gap will be provided between the rear end of the seat cushion and the lower end of the seatback. Hence, the seatback can be adjusted in position (i.e., position of its surface) in accordance with the occupant's physique (i.e., height), if the seat cushion and the seatback are lifted and lowered relative to each other.

While an embodiment of the invention has been described, it has been presented by way of example only, and is not intended to limit the scope of the invention. Any change and modification made within the scope of the invention are, of course, included in the present invention.

The embodiment described above is a vehicle seat, as in most cases. However, the present invention can be modified as any seats that have a seat cushion and a seatback, and is not limited to a vehicle seat.

One example of the lifting/lowering means of the seat cushion and the seatback and the seat sliding mechanism **70** can be disclosed below.

1. The seat further comprises an inclination mechanism configured to incline the seatback forward with respect to the strut, and setting a rotation center of the seatback at the lower part of the back of the seatback.

2. The lifting/lowering means includes a seat lifter provided between the riser and the seat cushion and configured to lift and lower the seat cushion.

3. The strut includes a fixed main unit coupled at the lower end to the rear end of the riser, and a movable pole securing the seatback at the front and guided by and slided along the fixed main unit; and the lifting/lowering means includes a seatback lifting/lowering mechanism which is configured to lift and lower the seatback and the movable pole, which has a fixed rail and a movable rail, the fixed rail is secured to the fixed main unit, and the movable rail is mounted on or in, guided by and slided along the fixed rail.

4. The strut includes a fixed main unit coupled at the lower end to the rear end of the riser, and a movable pole securing the seatback at the front and guided by and slided along the fixed main unit, and the lifting/lowering means; and the lifting/lowering means includes a seat lifter provided between the riser and the seat cushion and configured to lift and lower the seat cushion and a seatback lifting/lowering mechanism which is configured to lift and lower the seatback and the movable pole, which has a fixed rail and a movable rail, the fixed rail is secured to the fixed main unit, and the movable rail is mounted on or in, guided by and slided along the fixed rail.

5. The seat further comprises an inclination mechanism configured to incline the seatback forward with respect to the strut, and setting a rotation center of the seatback at the lower part of the back of the seatback.

6. The seat further comprises left brackets and right brackets provided on a middle part and lower end of the back of the seatback, respectively, and spaced apart in up-down direction, and

a pair of pins extending from the movable pole and pivotally supported on the lower brackets of the back of the seatback, respectively, and serving as rotation center of the seatback.

The inclination mechanism includes: first and second main links pivotally supported, by pins, on the upper brackets provided on the seatback, and connected together, at one end, by a connecting rod; a drive link secured to the other end of the first main link and having a section gear at a free end; a regulation link secured to the other end of the first main link, outside the drive link; an actuator incorporating a motor having a pinion gear, secured to the movable pole and configured to drive the pinion gear and set in mesh with the section gear of the drive link, to rotate the drive link and the main link, thereby to incline the seatback with respect to the movable pole; and a pin extending from the other end of the first main link and passing through two holes made in the drive link and the regulation link, respectively, the hole made in the regulation link being an arching elongated hole.

7. The seat further comprises left brackets and right brackets provided on a middle part and lower end of the back of the seatback, respectively, and spaced apart in up-down direction, and

a pair of pins extend from the movable pole and pivotally supported on the lower brackets of the back of the seatback, respectively, and serving as rotation center of the seatback.

The inclination mechanism includes: first and second main links pivotally supported, by pins, on the upper brackets provided on the seatback, and connected together, at one end, by a connecting rod and the first main link having a section gear at a free end; a regulation link secured to the other end of the first main link, outside the first main link; an actuator incorporating a motor having a pinion gear, secured to the movable pole and configured to drive the pinion gear and set in mesh with the section gear of the first main link, to rotate the main link, thereby to incline the seatback with respect to the movable pole; and a pin extending from the other end of the first main link and passing through a hole made in the regulation link, the hole being an arching elongated hole.

8. The actuator of the inclination mechanism has a torque limiter that controls the output of the motor, and transmits the output so controlled to the pinion gear.

9. The seat is a vehicle seat which is mounted on the riser arranged on the vehicle floor via a seat sliding mechanism or not.

What is claimed is:

1. A seat comprising:

a seat cushion; and

a seatback having an upper half and a lower half formed integral with the upper half;

wherein the upper half of the seatback has a seat surface extending upward, first inclined backward and then inclined forward before a top part;

the lower half is narrower than the upper half;

the seat cushion has a U-notch, as seen from an upper surface side of the seat cushion, made in a middle part of a rear end and loosely holds the lower half of the seatback in the U-notch, and the seat cushion and the seatback are lifted or lowered, relative to each other without providing a gap between the rear end of the seat cushion and the lower end of the seatback;

the rear end of the seat cushion bulges at left and right edge;

the seat cushion is lifted and lowered by a seat lifter; and

wherein the seatback is secured to a strut, and the strut comprises a fixed pole and a movable pole able to move with respect to the fixed pole; and the seatback is secured to the movable pole and is lifted and lowered and inclines to the movable pole forward and backward.

2. A seat comprising:

a seat cushion; and

a seatback having an upper half and a lower half formed integral with the upper half;

wherein the upper half of the seatback has a seat surface extending upward, first inclined backward and then inclined forward before a top part;

the lower half is narrower than the upper half;

the seat cushion has a U-notch, as seen from an upper surface side of the seat cushion, made in a middle part of a rear end and loosely holds the lower half of the seatback in the U-notch, and the seat cushion and the seatback are lifted or lowered, relative to each other without providing a gap between the rear end of the seat cushion and the lower end of the seatback;

the rear end of the seat cushion bulges at left and right edge; and

the seatback is secured to a strut, and the strut comprises a fixed pole and a movable pole able to move with respect to the fixed pole; and the seatback is secured to the movable pole and is lifted and lowered and inclines to the movable pole forward and backward.

3. A seat comprising:

a seat cushion; and

a seatback having an upper half and a lower half formed integral with the upper half;

wherein the upper half of the seatback has a seat surface extending upward, first inclined backward and then inclined forward before a top part;

the lower half is narrower than the upper half;

the seat cushion has a U-notch, as seen from an upper surface side of the seat cushion, made in a middle part of a rear end and loosely holds the lower half of the seatback in the U-notch, and the seat cushion and the seatback are lifted or lowered, relative to each other without providing a gap between the rear end of the seat cushion and the lower end of the seatback;

a surface of a middle part of the upper half is further receded;

the rear end of the seat cushion bulges;

the seat cushion is lifted and lowered by a seat lift; and

the seatback is secured to a strut, and the strut comprises a fixed pole and a movable pole able to move with respect to the fixed pole; and the seatback is secured to the movable pole and is lifted and lowered and inclines to the movable pole forward and backward.

4. A seat comprising:

a seat cushion; and

a seatback having an upper half and a lower half formed integral with the upper half;

wherein the upper half of the seatback has a seat surface extending upward, first inclined backward and then inclined forward before a top part;

the lower half is narrower than the upper half;

the seat cushion has a U-notch, as seen from an upper surface side of the seat cushion, made in a middle part of a rear end and loosely holds the lower half of the seatback in the U-notch, and the seat cushion and the seatback are lifted or lowered, relative to each other without providing a gap between the rear end of the seat cushion and the lower end of the seatback;

a surface of a middle part of the upper half is further receded;

the rear end of the seat cushion bulges; and

the seatback is secured to a strut, and the strut comprises a fixed pole and a movable pole able to move with respect to the fixed pole; and the seatback is secured to the movable pole and is lifted and lowered and inclines to the movable pole forward and backward.

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